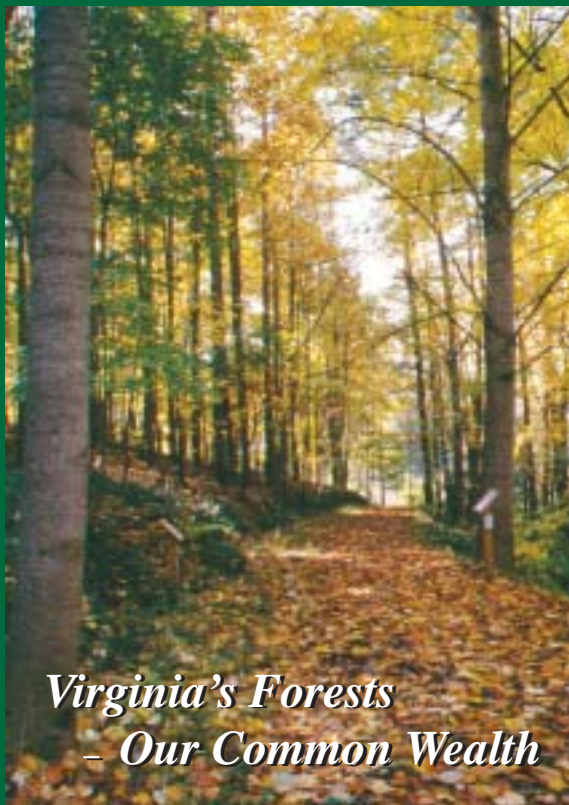




Forestry Nature Trail Guide



*Virginia's Forests
– Our Common Wealth*

Hike at your own risk. Enjoy your walk.

Directions: The Forestry Nature Trail is located near the Virginia Department of Forestry State Headquarters. From US 29, exit onto Fontaine Avenue (Route 29 business) toward Charlottesville. Turn right into Fontaine Research Park. At the top of the hill, turn right again onto Ray C. Hunt Drive which becomes Natural Resources Drive. Follow the signs to the Department of Forestry. Turn left before the Visitors' parking lot, and follow road around behind the brick headquarters building. Look for the Nature Trail welcome sign at far side of parking lot.

Virginia Department of Forestry
Fontaine Research Park
900 Natural Resources Drive, Suite 800
Charlottesville Virginia, 22903

VIRGINIA FORESTS – OUR COMMON WEALTH

Welcome to the **Forestry Nature Trail**, a one-mile rustic footpath that loops through a Virginia Piedmont forest.

A forest is a wonderfully complex, ever-changing community of living organisms dominated by trees and other woody plants. Forest organisms interact with each other and with the non-living parts of their environment. Humans are part of this forest community.

Virginia forests provide a wealth of natural resources: wildlife habitat, water and air quality protection, beautiful scenery, and recreation opportunities. Forests also provide valuable raw materials that support a thriving forest products industry. We can all share in the forests' wealth. We can all take responsibility for ensuring that forests will provide these resources in the future.

One of the best ways to learn about forests is to visit them. Observe, ask questions, think about what you have already learned about the natural world. This trail guide supports specifically Virginia's 4th grade curriculum, but students of all ages will enjoy the lessons. There are opportunities for learning by seeing, listening, touching, and smelling.

Please visit the Forestry Nature Trail often. This forest contains a wealth of material for illustrating school lessons, and we purposely included more than most hikers will want to absorb in one visit. Feel free to stop and read as frequently or as much as you like. You may want to focus on a different portion of the trail each time you come. The forest offers opportunities for learning new things on every visit.

At the end of your visit, please return this trail guide to the welcome sign for use by other hikers, or keep it for your own use. Online copies of this trail guide and more information about forests are available at www.dof.virginia.gov.

Virginia Standards of Learning:

Science 4.1e, 4.1f, 4.4, 4.5, 4.6, 4.8

Virginia Studies VS.1d, 1f, 1i, VS.2b, 2c, VS.3f, VS.6d, VS.8c, VS.9a, VS.10b

Math 4.6, 4.7, 4.8, 4.11a, 4.20

English 4.3c

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Published: May 2004

1 Questions to think about during your walk

- ◆ Do forests stay the same forever?
- ◆ Do trees die?
- ◆ What lives in this forest besides trees?
- ◆ What clues tell us that animals live here?
- ◆ Where do forest animals find food or shelter?
- ◆ If a forest changes, what happens to the animals that live there?
- ◆ What clues tell us that humans have visited this forest?
- ◆ Do humans help or hurt forests? Or both?

2 Try to imagine rows of corn or tobacco growing here.

Forests covered much of Virginia when English colonists arrived here in the 1600s. Early Virginia farmers cut trees for houses, furniture, firewood, and for sending wood back to England. They cleared forests for pastures and cropland, raised animals, and grew a variety of crops for personal use and for market.

Growing tobacco quickly used up the nutrients in the soil. When their fields would no longer produce good crops, farmers abandoned them and made new fields by clearing more forests. When those new fields stopped producing, some farmers moved west looking for new opportunities.

In the late 1800s, loggers cleared most of Virginia's remaining mature forests to provide lumber and fuel for rapidly growing cities, railroads, and industries.

If this forest were cleared, what would happen to the wildlife that lives here?

3 If you were a bat, where would you hide in the forest?

As a shagbark hickory tree matures, its bark separates into loose plates. You may poke your finger into the spaces, but do not break the bark. Small animals, like insects and spiders, hide from predators or lay eggs under these plates. The Indiana bat, an endangered species, roosts in shagbarks in western Virginia forests.



Photo Credit: © Merlin D. Tuttle, Bat Conservation International; www.batcon.org

Indiana bat hiding under bark

Is it easy to push your bare hand between the dense sharp prickly leaves of an American holly? Ouch! Trees in the forest provide shelter for many small animals. Northern cardinals easily dart in between holly leaves to hide from large predators or to build nests.



Photo Credit: Diana Foster

*American holly (*Ilex americana*)*

4 Decomposers are natural recyclers.

Throughout their lives, trees and other green plants make their own food with sunlight, and with water and nutrients absorbed from soil. Nutrients become part of the tree and remain there as long as the tree lives.



Trees don't live forever. Trees die because of old age, disease, stormy weather, or human actions. Decomposers are organisms that break down dead plants and animals into simpler substances that can be recycled into new plants. Decomposers are breaking down the dead trees in this forest.

5 A Rottin' Habitat

The different sized holes on these stumps tell us that animals have used them for shelter and nesting sites.

Carpenter ants invade stumps, especially if termites or decomposers have already softened the wood. Ants chew soft wood to make tunnels where they lay eggs. The eggs hatch to become larvae. Ants do not eat wood; they leave the stump to search for other insects and sweet honeydew produced by aphids.

Pileated woodpeckers pull bark off stumps and excavate deep holes to find ants and larvae.

Carpenter ants and pileated woodpeckers require habitat with dead trees and stumps.



Carpenter ant queen with eggs

Photo Credit: Jim Kalisch, Univ. of Nebraska-Lincoln Entomology



Pileated woodpecker

Photo Credit: Carrol Henderson, Minnesota Dept. of Natural Res. Non-game Wildlife Prog.

6 Can you hear a stream?

Virginia's Piedmont is characterized by rolling hills like this one. Water in the stream at the bottom of this hill may have come from the mountains of the Blue Ridge. It may have paused for a while in the Ragged Mountain

Reservoir. It will now continue eastward across the Piedmont, down the sharp elevation change at the Fall Line, onto the Coastal Plain, and into the ocean.



Virginia's five geographic regions

Photo Credit: C. M. Bailey, William and Mary Geology

7 From Forest to Field to Forest

Soil is a valuable natural resource that provides nutrients necessary for plant growth. It takes a very long time to form. Early farming practices allowed valuable topsoil to wash downhill into streams. In the late 1800s when it became hard to make a living from farming, many people moved into cities to find work. They left behind abandoned fields. Soil continued to erode into streams. Can you find an old rusting farm fence?

In the early 1900s, people learned that tree roots hold onto soil and prevent soil erosion. Virginia created the original Department of Forestry with a big mission: reforest lands cleared by farming, logging, and mining; protect streams; encourage people to grow trees for timber; and manage forests using scientific principles.



Photo Credit: Virginia
Department of Forestry

Soil washed away from abandoned fields.

In the 1930s, Forestry and Civilian Conservation Corps men planted millions of trees throughout Virginia. This old Douglas-fir is one of those trees.

8 Poison ivy, *Toxicodendron radicans* (tox i co den' dron rad' i cans)

We can learn about poison ivy by analyzing the origin of its scientific name.

Many people are allergic to the poisonous (Greek *toxikon*, poison) oil that coats all parts of the plant. Its woody stem (Greek *dendron*, tree) is covered with rootlike hairs (Latin *radix*, root).

While many people consider it a pest, poison ivy is valuable to wildlife. More than fifty kinds of birds eat its small white fruits, and several birds use the rootlike hairs as a nest building material.



Photo Credit: David J. Moorhead, The University
of Georgia, ForestryImages.org

Leaflets three; let it be.

9 Please leave this forest litter here.

Try blowing apart the needles that lie on the forest floor. Press down on them. The spongy tangled mat of dead needles, cones, and twigs on the forest floor is called "litter."

Beneath the litter, soil contains nutrients that trees and other forest plants need for growth. Litter protects soil from blowing away in the wind or rushing downhill into streams during rains.

Forest litter acts like a sponge. It absorbs rainwater and later releases it slowly into the soil for plants to absorb. Extra water trickles down deeply to replenish groundwater.

10 Trees begin life as seeds.

These pine trees grew from seeds that had formed inside cones. Look around for tall pine trees that still have cones in their tops. When cones are mature, they open and release seeds adapted with paper-thin "wings." Wind blows the seeds away from the tree. If pine seeds land on soil with sufficient moisture and sunshine, they may sprout and grow up to become new trees.



Pine seed adapted for wind travel

Photo Credit: Darrell Vodopich, Biologyimages.com

11 How can a pond protect a stream?

Building roofs, roads, and hard surfaced parking lots prevent rainwater from soaking into the soil on top of the hill. During rainstorms, water rushes off paved surfaces, carrying away sediment and small particles.

Pipes channel storm water into this retention pond. Sediment and other heavy particles settle to the bottom of the pond. Excess water slowly continues downhill but without the sediment. The retention pond protects clean water in the stream at the bottom of the hill. The pond also provides water for wildlife.

12 Are you a producer or a consumer?

View this field at ground level through the eyes of a meadow vole. Can you find a tunnel runway into the miniature jungle of grasses, briars, and young trees above you? Can you find roots, tender bark, fruit, or seeds for food? Or maybe a yummy grasshopper? Can you find a place to hide from an owl or to build a nest?

Plants are called “producers” because they can make their own food from the sun’s energy. “Consumers” are organisms that cannot make their own food. Consumers get their energy by eating producers or other consumers.

A “biological community” includes all the plants, animals, and other organisms that live in a particular place. A community contains both producers and consumers. Is a meadow vole a producer or consumer?



Photo Credit: Phil Myers, The University of Michigan Museum of Zoology

Meadow vole

13 Why do pine needles have a waxy coating?

Leaves are the food-making factories in trees. Making food requires sun and water. Water comes up to the leaves from the roots. Unused water exits through tiny leaf holes called “stomata.” What do trees do in winter when it is cold and there is not enough sunlight or water for making food?

Pine trees enter a resting period called “dormancy” in winter. They slow down the food-making process to use less water. They lose a few needles each year but hold onto enough of them so that we say that they are “evergreens.” Pine needles are leaves adapted to conserve water inside the tree. Their skinny shape, their waxy coating, and even the shape of their tiny stomata help hold in water.



Photo Credit: Diana Foster

*Shortleaf pine (left, *Pinus echinata*) needles in bundles of 2 or 3; Virginia pine (*Pinus virginiana*) needles in bundles of 2*

14 How do deciduous trees survive winter?

Oak trees have special adaptations for entering a resting period during winter when there is not enough sun and water for making food.

In late summer as days get shorter, oak leaves slow down the food-making process. Each leaf forms a thin separation layer where the leaf stalk attaches to the branch. A corky plug forms over the hole on the branch, preventing water loss. The leaf turns brown and eventually falls off. Trees that drop all their leaves each year are called “deciduous.” In spring, when sunlight and water are more plentiful, new leaves grow.



Photo Credit: Diana Foster

Post oak (Quercus stellata)

15 Roots, a tree's hidden strength

Underground, big roots branch into smaller and smaller roots. Roots grow longer at their tips and push their way between rocks and soil particles in search of water. Microscopic root hairs absorb water and soil nutrients for the tree.

The tree's network of roots, rootlets, and root hairs holds onto soil and rocks with incredible strength. Roots anchor the tree into the ground. Roots hold soil in place during rainstorms, preventing soil erosion.

Trees help protect the clean water of our streams.



Photo Credit: Diana Foster

Tree roots hold soil.

16 What's the connection between railroads and forests?

Trains started running on these tracks in 1852. Steam engines and narrow gauge railroads pushed farther and farther into remote mountains of western Virginia, opening up new forest lands for timbering. Trains transported forest products long distances to Richmond and other growing cities.

By 1900, most of Virginia's mature forests had been cleared for farmland, fuel, building materials, railroad ties, and charcoal for Virginia's iron furnaces.

17 Good guys or bad guys?

Look for white shelf-like "bracket fungi" growing on this black cherry tree. Fungi (fun' jee, plural) are organisms that cannot make their own food. They live in or around other organisms and absorb nutrients from them.

The food absorbing part of this fungus (fun' gus, singular) is hidden inside the tree. Microscopic threads are invading the wood and making chemicals that break down the wood into simpler substances. The fungus absorbs these simpler substances as food.

Although a few fungi can kill trees, most fungi are beneficial to the forest because they decompose dead plants and animals.



Photo Credit: George Barron

Fungi threads decompose wood.

18 Trees are the tallest, most massive, longest-lived organisms ever to grow on earth.

The yellow-poplar is one of Virginia's tallest trees. How does water from the soil get all the way up to its leaves?

Water molecules like to stick together. They move together from wet places to dry places. Water in soil enters a tree through its roots, travels up through the trunk, and exits by evaporating out of tiny holes in leaves.

Plant stems, including tree trunks, are a collection of tubes that transport water, nutrients, and food. Evaporation and the characteristics of water move water up stems, even the tall trunk of a yellow-poplar.

Try this at home:

1. Dip the end of a dry paper towel into a puddle of colored water. What happens? Why?
2. Make a fresh cut in the bottom of a celery stalk. Let the celery sit in colored water for a day. Have the leaves changed? Cut off the bottom of the stalk. Observe cut surface. Can you see where water was pulled up the stalk?



Photo Credit: Diana Foster

Water moves in tubes in celery stems and in tree trunks.

19 Wind, a pine's best friend

To make plant seeds, male sex cells in pollen must join female sex cells in an ovule. The tricky part is getting the pollen and ovule together.

Pines have male cones that last just long enough to produce pollen and longer-lasting female cones where seeds form. In spring, male cones located at the ends of branches release millions of tiny pollen grains. Wind blows pollen around in clouds of yellow dust. If a pollen grain lands on a female cone, it can make its way down between tiny cone scales to reach the ovule. If the male sex cell in the pollen fertilizes the female sex cell in the ovule, a new seed can develop.



Photo Credit: Diana Foster

Virginia pine, male (left) and female cones

20 Insects make great pollinators.

In spring, look for the yellow-poplar tree's tulip-shaped flowers. Light green "sepals" protect the yellow-green and brilliant orange petals before they open. Pollen, containing male sex cells, forms on fat cream-colored "stamens." At the bottom of a fat pointed "pistil" is a fleshy "ovary" enclosing "ovules," immature seeds containing female sex cells.

Flies, beetles, and bees visit yellow-poplar flowers in search of sweet nectar. Walking across a flower, the insect brushes against a stamen and collects pollen on its legs and body. Looking for more nectar in the same or a different flower, the insect then walks by the "stigma," the top part of the pistil. Pollen grains stick to the stigma, bringing together the male and female sex cells.

Pollination is the transfer of pollen from stamen to stigma.



Photo Credit: Diana Foster

Yellow-poplar, sometimes called tuliptree (*Liriodendron tulipifera*)

21 Birds are tree planters too.

A cherry tree begins life as a seed – sometimes as a seed that was in bird poop. If a seed tried to grow right under its “mother” tree, it would have to compete with its parent for sunlight, water, and nutrients. Instead, cherry trees have seeds adapted for traveling far away and having a better chance of survival.

Each cherry seed has a protective hard woody seed coat hidden inside tasty fleshy fruit. A fruit-eating bird or mammal eats the cherry, digests the fleshy layer, passes the seed through its digestive tract unharmed, and – usually after traveling to a new place – passes the seed out in its droppings. If the seed lands in a place with favorable growing conditions, it can become a new tree.



Black cherry (*Prunus serotina*)

Photo Credit: Ken Sysma, Univ. of Wisconsin Plant Image Teaching Collection

22 Become a Tree ID expert.

“Eastern white pine (*Pinus strobus*) needles are soft bluish-green, 2½ to 5 inches (6 to 13 centimeters), in bundles of 5,” says a tree identification (ID) guidebook.

Observe the pines near this sign. Use needles (the tree’s leaves) to identify Eastern white pines. Look for trees with needles in bundles of 5 (hint: w-h-i-t-e is 5 letters). Measure needles in both inches and centimeters to confirm identification. Use ruler on back cover.

Identify at least five Eastern white pines in this group of trees. Be careful. There are other pines here with needles in bundles of 2 and 3. They are not Eastern white pines.

23 Can you calculate the average age of these Eastern white pines?

Each year an Eastern white pine grows a new group of branches called a “whorl” at the tree’s top. You can tell the approximate age of a pine tree by counting the number of whorls from top to bottom. Be careful to include in your count whorl scars on the trunk where branches used to be but are now gone.

Identify five Eastern white pine trees by counting needles, 5 in a bundle.

Count the number of whorls on each tree. Add up the total number of whorls for the five trees. Divide the total by five to find the average age of these five trees.

24 Virginia Trees for Virginia Forests

The Department of Forestry created one of its first State Nurseries on this hilltop to grow seedlings for reforesting Virginia in the early 1900s.

Today two State Nurseries grow more than fifty species of trees and shrubs for reforestation, timber production, Christmas tree plantations, wildlife habitat, erosion control, and stream protection.

Foresters use science to develop trees best suited to Virginia soils and climate. They also develop “super trees” that grow faster than normal and are more resistant to insects and disease.



Early State Nursery

Photo Credit: Virginia Department of Forestry

25 Pioneers have to be tough to survive.

This hillside gets a lot of human action. People dug up the soil to bury sewer pipes. People frequently mow down the plants. Each year black locusts trees grow back.

Black locusts have adaptations that make them good “pioneer trees” on disturbed land. They tolerate soil that has few nutrients. They grow quickly when young. They spread easily by seeds that blow in the wind and by stems that sprout up from roots.

Foresters observed how quickly black locusts grow in nature. They recommend black locusts for reforestation of lands hurt by poor farming practices and by surface mining.



Photo Credit: Diana Foster

Thorny bark of young black locust (Robinia pseudoacacia)

26 Why does this tree have bends in its trunk?

Something bent this red maple down early in its youth. Wind? Ice? Another tree? The tree had to get its leaves back up into sunlight for making food if it was going to survive. How did the tree accomplish this challenging task?

A tree gets taller by growing new cells at the uppermost tip of its trunk (the tree's stem). Scientists have observed that plant stems grow up *away* from the earth's gravity and up *toward* sunlight.

This red maple was able to return its trunk to a vertical position by growing upward at its tip.

Try this at home:

Grow bean seeds in a pot of soil until they are several inches tall. Carefully lay the pot down on its side. Watch how the bean stem grows over the next few weeks. Does the stem turn upward?

27 Goods from the woods

We're surrounded in our daily lives by products that come from trees. Trees are a renewable natural resource as long as we take good care of our forests. We can grow healthy trees in cultivated forests. We can help trees resist pests. We can plant new trees for the future. We can harvest trees and protect important forest resources: wildlife habitat, water quality protection, scenic beauty, and recreational opportunities.

Virginia forest products industries – growing trees, caring for forests, harvesting forest products, manufacturing forest products, and distributing goods throughout the United States and the world – provide a livelihood to thousands of Virginia workers.

How many products can you list that come from trees?



Northern red oak (Quercus rubra)
used in flooring

Photo Credit: National Oak Flooring
Manufacturer's Association



Photo Credit: Southern Forest Products
Association

*Shortleaf pine (Pinus
echinata)* used in
building construction

28 Who is winning the competition for sun?

Tall pine trees once dominated this hillside. Their branches and needles formed a canopy, like an umbrella overhead. Seeds from pines and other trees landed on the forest floor, but it was too shady for most of them to grow.

Pines have a natural life span. After they reach "old age," they drop dead branches. Sunlight can now reach the forest floor, allowing yellow-poplar seeds to germinate and grow – fast! Yellow-poplars are now growing above the pine canopy and shading the pines. Pines are adapted to grow only in full sunlight so they are dying. Here it is easy to see that the forest is changing.

29 Adapting to life in the understory

“Understory” is the world of bushes and small, young trees that grow beneath the taller trees in the forest.

If you were designing leaves for a tree that lives in a shady forest understory, what would they look like? Size? Shape? Arrangement on the branches? How could you capture the most sunlight?

Would your leaves look like the big leaves of the umbrella magnolia?

If you are visiting in winter, look for the long pointed buds that protect the tree’s young leaves.



Photo Credit: Diana Foster

Umbrella magnolia (Magnolia tripetala)

30 Why did soil come up when this cherry tree fell?

What does this mound of soil tell us about the growth and strength of roots?

How do living trees in the forest protect clean water in streams?

Review trail stop number 15, “Roots, a tree’s hidden strength.”

31 Creative adaptations for climbing up to sunlight

A vine is a plant with a long slender stem. The stem is not strong enough to support the weight of the plant.

The vines growing here started life as seeds dropped on the shady forest floor by animals. How are they getting their leaves up to sunlight for making food?

The vines are using neighboring trees for support. Poison ivy grabs onto rough places in a tree's bark with its aerial roots. Other vines here climb by growing around the tree, wrapping tendrils around a stem, or holding on with little sticky pads.



Wild grape tendril

Photo Credit: Mike Clayton, University of Wisconsin Plant Image Teaching Collection

32 What incredible behavioral adaptation is keeping this fallen cherry tree alive?

To grow, a tree needs water, nutrients, and sunlight.

The cherry's roots are still in soil and can absorb water and nutrients. Its partially broken trunk can still transport water, nutrients, and food. The tree needs to get its leaves into a good position for capturing sunlight for making food.

On what side of the trunk are the tree's branches growing? Is the tree adapted to grow branches up toward the sun or down into the shade?

33 Can you find clues that help identify what killed this pine tree?

Hint: look on the trunk and on dead fallen branches.

Can you find holes where insects ate through the tree's bark? Round holes? Oval holes? Holes near the ground; holes higher on the trunk? Holes filled with dried sap or sawdust? "Galleries" randomly curved or shaped like the letters S, Y, X, or H where insects chewed tunnels?

All of these findings are clues to tell if insects killed the tree or if they simply invaded the wood after the tree was already dying. Different kinds of insects have unique life cycles and behaviors so that several species can live in one tree at the same time without competing. Foresters use clues to identify insect pests in order to protect healthy trees.



Southern pine sawyer larva in galleries

Photo Credit: Clemson Univ., USDA Coop. Extension
slide Series, ForestryImages.org

34 Use your hands and head to measure this giant loblolly pine.

Spread your fingers wide. Count the number of "hands" it takes to go all the way around the trunk of this loblolly pine. Measure the length of your "hand" in inches using the ruler on the back of this trail guide. Multiply the *number of hands* times your *hand measurement*. The product of these two numbers tells you this tree's circumference (how big around it is).

Repeat this exercise using centimeters. Repeat this exercise with other trees to see which tree on the trail has the biggest circumference.

35 What has a bark but doesn't bite? A tree!

Feel how thick the bark is on this loblolly pine. Bark protects the tree from extreme temperatures, severe weather, insects and other animals, fungi, and fire.

Bark protects cambium, the living layer of the trunk. Cambium produces new wood for helping the tree stand tall. Cambium also produces new tubes for transporting water, nutrients, and food to all parts of the tree.

If bark is injured, disease pests can get into the cambium in the same way bacteria can enter your body through a cut in your skin. If a person or an animal cuts through the bark completely around the trunk (girdling) and injures the cambium, the tree might die because it cannot transport water, nutrients, and food to all parts of the tree.



Photo Credit: Diana Foster

Bark protects the living layer of the trunk.

36 Our connection to the Bay

Maury Creek is named in honor of the family that bought this land from Colonel James Monroe in 1809 and farmed it for more than 100 years. Their family home, Piedmont, stands less than a mile northeast of this creek.

Rain that falls on this land drains downhill and through the soil into Maury Creek. We are standing in the Chesapeake Bay watershed because all water that falls here drains toward the Bay.

If pollutants reach Maury Creek, they may harm organisms that live downstream.

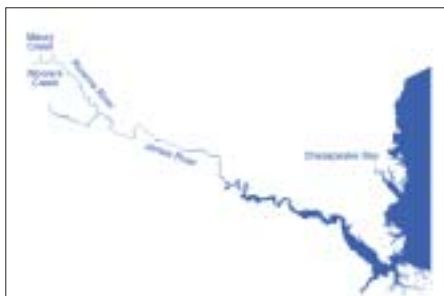


Photo Credit: Jason Overstreet

Maury Creek flows toward the Chesapeake Bay.

37 Mother Nature's Wildlife Manager

Beavers have fascinating adaptations for gathering wood for home construction and food.

On land, they balance on strong back legs and a flat tail while biting through bark with chisel-shaped incisors and powerful jaws. In water, they close their ear and nose openings, watertight flaps behind their teeth, and clear goggle-like eyelids. They build dams with hand-like front paws.

Beavers' ability to change the landscape is second only to that of humans. When beavers remove trees, sunlight reaches the forest floor, and new plants grow. Dams and woody debris in the creek slow current, send water over stream banks, and change growing conditions there for plants. Sticks in the stream provide new homes and food for aquatic animals.

Note: The Forestry Nature Trail and the Rivanna Trail share the same path along Maury Creek. Look for numbered signposts.

38 Black walnut trees are the first link to numerous land and water food chains.

On land, squirrels like black walnuts so much that early Seed Nursery workers found it difficult to plant nuts as seeds. The only thing that could stop a persistent squirrel was a hungry owl or hawk.

Luna moth caterpillars prefer to dine on the leaves. They, in turn, become food for bats.

When black walnut leaves fall into the creek, they enter water food chains. Insect larvae shred them into small digestible pieces. Predatory insects, fish, salamanders, and frogs eat the larvae.



Luna moth caterpillar

Photo Credit: Gerald J. Lenhard,
Louisiana State Univ., ForestryImages.org

39 Why do so many animals live in this streamside forest?

Listen for birds. Watch for quivering leaves as they duck for cover.

Many plants grow here – many varieties, many sizes. They have a lot of sun, moisture, and soil nutrients. Wind, water, and animals constantly bring in new seeds. Plant diversity provides a wide choice of food, shelter, and nesting sites, attracting many different land animals.

Two habitats come together here: forest and stream. Animals that live here enjoy the benefits of both. Raccoons find shelter in the forest but can feed on stream animals. Stream organisms find new hiding places in tree leaves that drop into the water. Green frogs feed on land animals but lay their eggs in water. Snapping turtles feed on water plants and animals but lay their eggs on land.

Note: The Forestry Nature Trail turns uphill away from the Rivanna Trail. Look for numbered signposts.

40 Protecting Maury Creek with natural filters and sponges.

Streamside forests – sometimes called “riparian forest buffers” – work like filters and sponges to protect our streams.

Trees and other forest plants slow runoff water that rushes downhill from roads and buildings. Plants trap sediment and other solid pollutants in the water. Roots, leaves, and woody debris on the forest floor reduce soil erosion. Plant roots absorb excess water and pollutants dissolved in water.

All plants and animals, including humans, need clean water to survive. Conserving streamside forests helps protect our valuable Virginia water resources.

41 Annual Rings – Using the strength of wood for standing taller

Each year a tree grows wider and stronger by adding a new layer of wood to its trunk. The layers appear as two-color rings because trees make new wood differently in spring than later in the growing season. The thickness of one annual ring reflects how much the tree grew that year. Fast growth produces wider rings.

Count this tree's "annual rings" to find its age. How old was it when it fell? If this tree fell in year 2003, approximately in what year did it start growing?



Photo Credit: Diana Foster

Does this graph show faster growth in earlier or later life?

42 Find two green plants that reproduce by spores.

On a north-facing slope, expect to find plants that prefer shady or moist habitats. Look for two plants here that stay green all year: Christmas ferns with their stocking-shaped leaflets, and soft springy moss.

Ferns and mosses are plants, but they reproduce by very tiny structures called "spores" rather than by seeds. Spores develop in special protective spore cases. When spores are mature, the cases open, and wind disperses the spores to new growing sites. Spores that land on moist shaded soil may germinate and produce new plants.



Photo Credit: Diana Foster

Christmas fern with spore cases on undersides of leaf (frond)



Photo Credit: Ari Kornfeld

Moss with spore capsules.

43 Shade is a problem for sun lovers.

Why is this Norway spruce missing branches on its side near the white pine? Why is the white pine missing many of its lower branches?

Tree leaves use sunlight to make food for the entire tree. When trees grow close together, high branches shade low branches. If needles on a shaded branch cannot get enough sunlight for making food, they die. The branch with dead needles may die and fall off.

Why are the lower branches of the Norway spruce on its side *away* from the white pine still alive? Can sunlight reach here?



Photo Credit: Diana Foster

Norway spruce
(*Picea abies*)

44 Not all plants are welcome in the forest.

Humans sometimes import plants from other places with the best of intentions: beauty, soil protection, food, medical benefits. Some of these plants grow too well and out-compete native plants for sun, water, or nutrients. We call these aggressive plants “invasive exotics.”

Invasive exotics are a problem. When we lose native plants, we lose wildlife that depend upon them for food or shelter.

Learning to identify and prevent the spread of invasive exotics can help conserve Virginia's rich variety of native plants and wildlife.



Photo Credit: James H. Miller;
USDA Forest Service,
ForestryImages.org

Tree of heaven (*Ailanthus altissima*)



Photo Credit: Chuck Barger, The University of Georgia, ForestryImages.org

Japanese honeysuckle
(*Lonicera japonica*)

45 A horizontal line of holes – the signature of the yellow-bellied sapsucker

A yellow-bellied sapsucker, a member of the woodpecker family, drilled these holes in the bark of this mockernut hickory.

Sapsuckers have amazing structural and behavioral adaptations for obtaining food. Feet with two toes in front and two in back, stiff tail feathers, and strong tail-feather muscles allow them to grip tightly to vertical surfaces. Shock-absorbing skulls protect their brains.

Sapsuckers, using their chisel-like bills, drill holes just deep enough to reach the sweet tree sap. As sap oozes out, they wipe it up with brush-like tongues. They return later to eat insects attracted to the sap.



Photo Credit: Carrol Henderson, Minnesota Dept. of Natural Resources Non-game Wildlife Program

Yellow-bellied sapsucker

46 Green Food Factories and Air Cleaners

Leaves capture sunlight and absorb its energy with the help of the green pigment chlorophyll. Now energized by the sun, the leaf can combine carbon dioxide from the air and water from the soil to make sugar. The tree uses sugar as food to help it grow and stay alive. This food-making process is "photosynthesis." Photosynthesis also produces oxygen, which exits leaves through tiny holes.

Trees and photosynthesis help keep our air clean. Trees produce oxygen, which animals, including humans, need to survive. Trees remove from the air carbon dioxide that animals breathe out as a waste gas. Trees are also important for removing carbon dioxide from burning fossil fuels in cars, power plants, houses, and industry. When we protect our forests, we are protecting our air quality.



Photo Credit: Diana Foster

Southern magnolia (Magnolia grandifolia)

47 Be careful what you touch!

One look at *Aralia spinosa* tells you the origin of the second word in its scientific name. A review of Roman mythology explains its common name (hint: read about Hercules' gruesome weapon). Few animals dare nibble on its spiny stem.

Openings in the forest canopy – look up! – bring exciting changes to a forest. Plants like Hercules' Club that require lots of sun can now grow. New plants offer new sources of food and shelter and attract increased wildlife.

What other sun-loving trees do you see under this “natural skylight”? Can you find the “parent” trees?



Photo Credit: Diana Foster

*Hercules' Club,
also called
Devil's Walking-
stick (Aralia
spinosa)*

48 How are snags useful to wildlife?

Managers of this forest wisely left a few dead standing trees, called “snags,” when they cut down pines killed by insects and storms.

Woodpeckers eat insects that live in the dead wood. Owls and hawks perch on the snag's top watching for prey.

Best of all, snags have the potential to develop cavities (holes) in which animals can rest, eat, build nests and raise young, escape from predators, seek shelter from storms, or hibernate.

When landowners clear land to create cultivated forests, they are helping wildlife if they save snags.

49 Can you find a “naked” seed?

Pine cones are seed containers! Look into the middle of one. Try to find two oval impressions on a cone scale where two mature pine seeds used to be. You may even find a seed still lying between two scales, adapted with a wing for floating in the wind.

Pine seeds are not enclosed by fleshy fruit like a cherry. Instead, they sit naked, exposed to air.

Some seeds are discovered by birds and squirrels before they are blown away by wind. What adaptations do these animals have that help them pry seeds out of a cone?

50 How can trees reduce our energy costs?

Blow air onto your left hand. Pick up a bundle of pine needles with your right hand, and hold them up between your mouth and your left hand. Blow again. Even though each needle is thin, when they are in a bundle they break up the force of wind. During storms and cold winters animals can hide in needle-covered branches. Many birds build nests on pine tree branches to be safe from strong winds.

Humans can learn from animals. We can plant trees near our homes to provide shade in summer or to block cold winds in winter.



Nest and eggs of a pine warbler

Photo Credit: From *A Field Guide to Birds' Nests*. © Hal H. Harrison. Reprinted by permission of Houghton Mifflin Co. All rights reserved.

51 Eastern redcedar, valuable shelter for wildlife

Eastern redcedar is one of the earliest and most common trees to grow in abandoned fields in Virginia. The tree's thin branches interlace to make a dense thicket in which birds and small mammals can hide from predators.

Look for two kinds of needles on one tree: scaly leaves that clasp the stem and sharp prickly needles that the tree made when it was young.

In pet stores, look for bags of "cedar bedding" for use in cages of some small animals. The fragrant wood chips come from redcedar trees.



Photo Credit: Diana Foster

Eastern redcedar (Juniperus virginiana), two types of needles

52 The Virginia Department of Forestry, State Headquarters

Forestry employees built this trail as a fun, relaxing place for learning about the wonderful and complex world of forests. They hope you have learned new things about our Virginia Forests – our Common Wealth.

Modern foresters understand that the forest is a community of organisms that depend on each other for their survival. Forests change. Human activities can have both positive and negative influences on a forest.

Forests provide wildlife habitat, water and air quality protection, beautiful scenery, recreation opportunities, and resources for an important forest products industry. Together, we can preserve all of these benefits for future Virginians.



Photo Credit: Virginia Department of Forestry

VDOF staff assist landowners and citizens.

53 What do the annual rings of this tree tell us about history?

Trees need sunlight, water, nutrients, and space for growth. If any of these is missing, growth will be poor, and the annual ring will be thin.

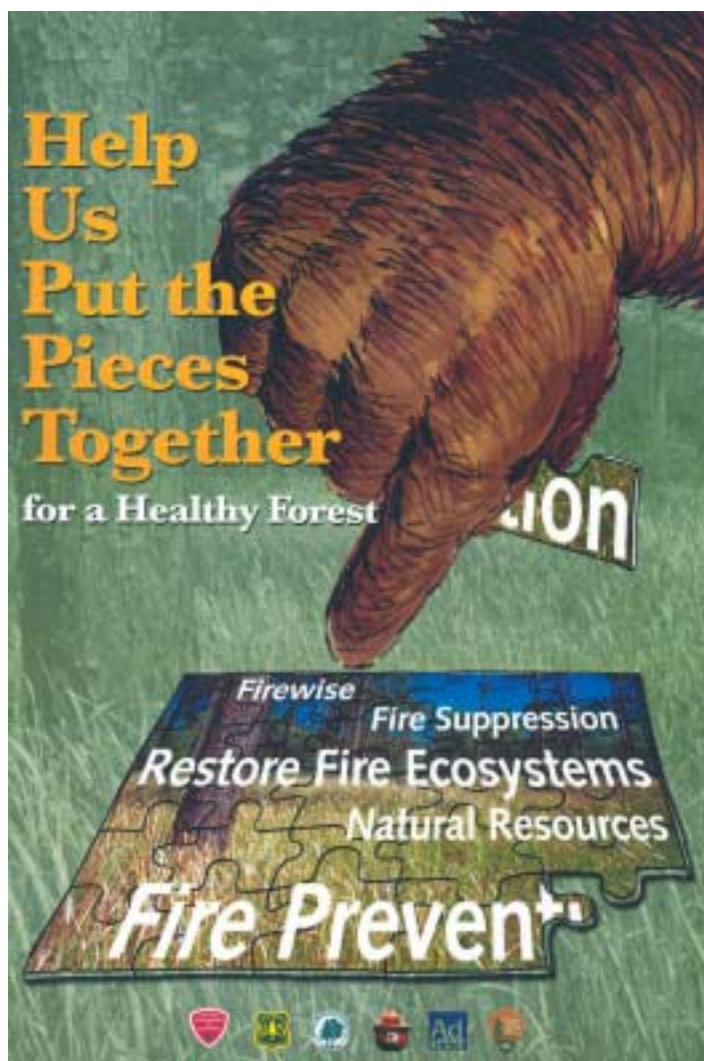
Studying annual rings is one tool for learning about long-term weather. History books tell us that many Jamestown settlers died of starvation and disease soon after arriving in 1607. Annual rings in ancient trees suggest that Virginia experienced a period of extraordinary drought soon after the settlers arrived. Fresh water was hard to get, and it was difficult for crops to grow with too little rain.

Do the annual rings of this pine tree suggest any periods of poor growth? Look for annual rings that are especially thin.

54 Questions to take home

- ◆ How does a forest help wildlife?
- ◆ How does a forest protect our streams?
- ◆ Who benefits from a prosperous forest products industry?
- ◆ Why is it important to have a nature trail in this forest?
- ◆ How can I take care of this forest?
- ◆ What did I learn new about this forest today?

Wildfire prevention is a team effort!



**Visit
www.FirewiseVirginia.org
for more information on
making your home
"FIREWISE".**

Forestry Nature Trail Hiking Guidelines

1. Keep to the trail.
2. No trespassing on adjacent property.
3. Pedestrians only. No bicycles or motorized vehicles.
4. Access between sunrise and sunset only.
5. Keep dogs on leashes.
6. Carry out all trash.

Trail description: The Forestry Nature Trail is a one-mile rustic footpath. The trail includes rough footing and several hills. The Virginia Department of Forestry and the Rivanna Trails Foundation, which manages this trail, cannot inspect the trail on a regular basis.

www.dof.virginia.gov

Project funding provided by:

Virginia Department of Forestry
National Fire Plan grant funds
Forest Stewardship grant funds
Urban and Community Forestry grant funds



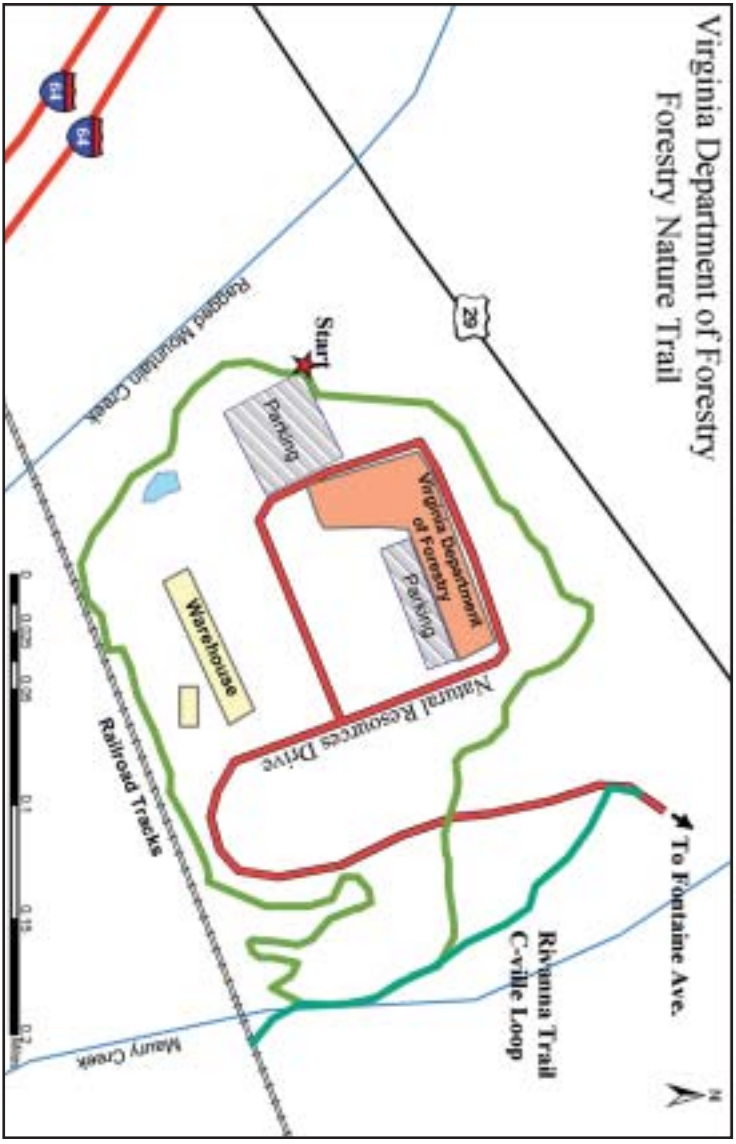
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All programs, activities and employment opportunities are available to all people regardless of race, color, national origin, sex, religion, age, disability, political belief, sexual orientation, and marital or family status.

VDOF P00122 ; 6/2004



Please return this trail guide to the welcome sign for use by other hikers, or keep it for your own use.